

Spot Safety Project Evaluation

Project Log # 200501227

Spot Safety Project # 04-99-219

**Spot Safety Project Evaluation of the Flashing Traffic Signal Installation at the Intersection of
NC 210 and SR 1330 (Raleigh Rd) in Johnston County**

Documents Prepared By:

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07/01/2005
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-99-219 – The intersection of NC 210 and SR 1330 (Raleigh Rd) in Johnston County.

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis of the treatment versus comparison data has been completed to measure the effectiveness of the spot safety improvement. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a flashing traffic signal. NC 210 is a two-lane facility with no left turn lanes at the intersection with SR 1330. SR 1330 is also a two-lane facility with no left turn lanes. NC 210 has a speed limit of 55 mph and SR 1330 has a speed limit of 45 mph. The intersection is controlled by stop signs on SR 1330 in the before period. It was stated that drivers had difficulty recognizing the existing traffic control devices (dual stop signs). The initial crash analysis for this intersection was completed from April 1, 1996 to March 31, 1999 which yielded 5 total crashes, 4 of them correctable by installing a flasher. A total of 3 were angle type crashes and 1 a left turn crash. These crashes resulted in 1 Fatality, 3 Class A injuries, and 5 Class B injuries. The final completion date for the construction of the flashing traffic signal was January 3, 2000.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from December 1999 through February 2000. The before period consisted of reported crashes from July 1, 1996 through November 30, 1999 (3 Years, 4 Months) and the after period consisted of reported crashes from March 1, 2000 through July 31, 2003 (3 Years, 4 Months). The ending date for this analysis was determined by the installation of a standard traffic signal. The plans were sealed on May 13, 2003 and the signal installed a few months after. The July 2003 accident was included since it showed no evidence of a standard traffic signal control device.

The analysis also consisted of two different sets of data, the treatment and the comparison data. The treatment data consisted of all crashes within 150 feet of the subject intersection. The comparison data consisted of all crashes within 150 feet, at the intersection of NC 210 and NC 50. The following data table depicts the Naive Before and After Analysis for the above information. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. These crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

| | | | |
|--|---------------|--------------|---|
| <u>Treatment Information</u> | | | |
| | Before | After | Percent Reduction (-) Percent Increase (+) |
| Total crashes | 7 | 7 | 0.00 |
| Total Severity Index | 47.49 | 5.23 | -88.99 |
| Frontal Impact Crashes | 6 | 7 | 16.67 |
| Frontal Severity Index | 54 | 12.28 | -77.26 |
| Volume | 3200 | 4900 | 53.13 |
| <u>Comparison Information</u> | | | |
| | Before | After | Percent Reduction (-) Percent Increase (+) |
| Total crashes | 24 | 16 | -33.33 |
| Total Severity Index | 5.01 | 8.98 | 79.24 |
| Frontal Impact Crashes | 16 | 8 | -50.00 |
| Frontal Severity Index | 5.93 | 3.77 | -36.42 |
| Volume | 6600 | 12500 | 89.39 |
| <u>Odds Ratio: Treatment versus Comparison</u> | | | |
| | Before | After | Percent Reduction (-) Percent Increase (+) |
| Treatment Total Crashes | 7 | 7 | 50.00 |
| Comparison Total Crashes | 24 | 16 | |
| Treatment F.I. Crashes | 6 | 7 | 133.33 |
| Comparison F.I. Crashes | 16 | 8 | |

The naive before and after analysis at the treatment location resulted in a 0.0 percent change in Total Crashes, a 16.67 percent increase in Frontal Impact Crashes, and a 53.13 percent increase in Average Daily Traffic (ADT). The comparison locations resulted in a 33.33 percent decrease in Total Crashes, a 50.0 percent decrease in Frontal Impact Crashes, and an 89.39 percent increase in ADT. The before period ADT year was 1997 and the after period ADT year was 2002.

The Odds Ratio is used as another means of calculating the treatment effect. The total crashes in the before and after period from the Comparison Intersection are used to calculate the percent reduction in total crashes for the Treatment Intersection. As shown in the table above, using the Odds Ratio calculation, there is a 50.0 percent increase in Treatment Intersection crashes and a 133.33 percent increase in Frontal Impact crashes.

Results and Discussion

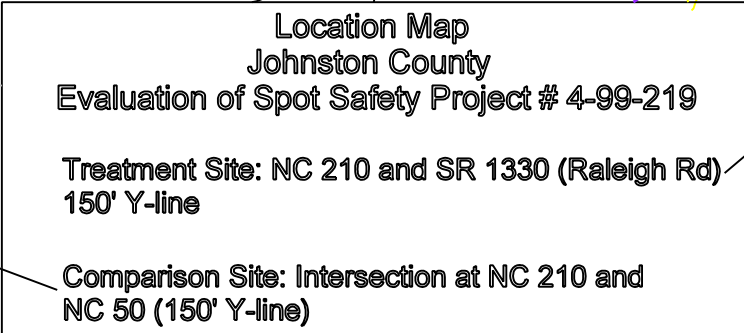
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 0.0 percent change in Total Crashes and a 16.67 percent increase in Frontal Impact Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 50.00 percent increase in Total Crashes at the Treatment Intersection and a 133.33 percent increase in Frontal Impact crashes. The summary results above demonstrate that the treatment location appears to have had an increase in the number of Total Crashes and an increase in the number of Frontal Impact Crashes from the before to the after period.

The flashing traffic signal was installed as a counter-measure to provide a safer intersection for the traveling public. As stated before there were issues with reports of drivers not recognizing the stop condition on SR 1330. Analysis of the crash diagrams and crash reports show significant evidence of consistent stop sign violations. In the before period 4 of 5 angle crashes were caused by stop sign violations, and 2 of 4 in the after period.

There were 9 angle crashes that occurred during the before and after period including 1 Fatal crash. Out of the 9 angle crashes, 7 of them involved vehicles traveling west on NC 210. Referencing the included pictures there is no current sight distance problem looking at the east approach from either the north or south direction. However, from the data provided it cannot be ruled out that there may have been a sight distance problem in the before and after periods. The pictures also show that the intersection has a 90-degree orientation so drivers should not have difficulty recognizing the stop condition.

The intersection was widened and cleared for installation of a traffic signal including turn lanes soon after signal plans were sealed on May 13, 2003. There were 4 crashes that followed (within 4 months) the installation, 3 of which were frontal impacts. This may be due to such a quick change in traffic control devices to which drivers are still adjusting. A future study may need to be implemented to further investigate the effects of the standard traffic signal for intersection recognition.

The countermeasure crash reduction for Total Crashes at the subject intersection can be in the range of a 0.0 to a 50.00 percent increase in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection can be in the range of a 16.67 to a 133.33 percent increase in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.



Facing East



Facing South



Facing West



Facing North



| | | | | | | | |
|--|------------------|--|-----------------|--|-----------------|---|-----------|
| | engine oil press | | engine oil temp | | 9 after 00 4555 | P | PERESTHON |
| | engine speed | | engine temp | | 10 after 10 10 | B | BOCYCLE |
| | engine pressure | | engine speed | | 20 after 20 20 | T | THAN |
| | engine speed | | engine pressure | | 30 after 30 30 | A | ANNA |
| | engine temp | | engine speed | | 40 after 40 40 | | |
| | engine pressure | | engine temp | | 50 after 50 50 | | |
| | engine speed | | engine pressure | | 60 after 60 60 | | |
| | engine temp | | engine speed | | 70 after 70 70 | | |
| | engine pressure | | engine speed | | 80 after 80 80 | | |
| | engine speed | | engine pressure | | 90 after 90 90 | | |
| | engine temp | | engine speed | | 10 after 10 10 | | |
| | engine pressure | | engine temp | | 20 after 20 20 | | |
| | engine speed | | engine pressure | | 30 after 30 30 | | |
| | engine temp | | engine speed | | 40 after 40 40 | | |
| | engine pressure | | engine speed | | 50 after 50 50 | | |
| | engine speed | | engine pressure | | 60 after 60 60 | | |
| | engine temp | | engine speed | | 70 after 70 70 | | |
| | engine pressure | | engine speed | | 80 after 80 80 | | |
| | engine speed | | engine pressure | | 90 after 90 90 | | |
| | engine temp | | engine speed | | 10 after 10 10 | | |
| | engine pressure | | engine speed | | 20 after 20 20 | | |
| | engine speed | | engine pressure | | 30 after 30 30 | | |
| | engine temp | | engine speed | | 40 after 40 40 | | |
| | engine pressure | | engine speed | | 50 after 50 50 | | |
| | engine speed | | engine pressure | | 60 after 60 60 | | |
| | engine temp | | engine speed | | 70 after 70 70 | | |
| | engine pressure | | engine speed | | 80 after 80 80 | | |
| | engine speed | | engine pressure | | 90 after 90 90 | | |
| | engine temp | | engine speed | | 10 after 10 10 | | |
| | engine pressure | | engine speed | | 20 after 20 20 | | |
| | engine speed | | engine pressure | | 30 after 30 30 | | |
| | engine temp | | engine speed | | 40 after 40 40 | | |
| | engine pressure | | engine speed | | 50 after 50 50 | | |
| | engine speed | | engine pressure | | 60 after 60 60 | | |
| | engine temp | | engine speed | | 70 after 70 70 | | |
| | engine pressure | | engine speed | | 80 after 80 80 | | |

NC 210
55 MPH

















































































































































SR 1330 (RALEIGH RD)
45 MPH

collisiondiagram.dgn 11/16/2005 11:12:40 AM

Treatment Site - TotalCrashes
After Period
March 1, 2000 - July 31, 2003
(3 years 5 months)
Johnston County

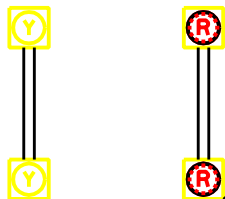


LEGEND

| | | | | | | | |
|---|------------|---|------------|---|----------------|---|------------|
|  | Vehicle |  | Vehicle |  | 9 mph or less | P | PEDESTRIAN |
|  | Motorcycle |  | Motorcycle |  | 10 mph to 19 | B | BICYCLE |
|  | Truck |  | Truck |  | 20 mph to 29 | T | TRUCK |
|  | Truck |  | Truck |  | 30 mph to 39 | A | ANIMAL |
|  | Truck |  | Truck |  | 40 mph to 49 | | |
|  | Truck |  | Truck |  | 50 mph to 59 | | |
|  | Truck |  | Truck |  | 60 mph to 69 | | |
|  | Truck |  | Truck |  | 70 mph to 79 | | |
|  | Truck |  | Truck |  | 80 mph to 89 | | |
|  | Truck |  | Truck |  | 90 mph to 99 | | |
|  | Truck |  | Truck |  | 100 mph to 109 | | |
|  | Truck |  | Truck |  | 110 mph to 119 | | |
|  | Truck |  | Truck |  | 120 mph to 129 | | |
|  | Truck |  | Truck |  | 130 mph to 139 | | |
|  | Truck |  | Truck |  | 140 mph to 149 | | |
|  | Truck |  | Truck |  | 150 mph to 159 | | |
|  | Truck |  | Truck |  | 160 mph to 169 | | |
|  | Truck |  | Truck |  | 170 mph to 179 | | |
|  | Truck |  | Truck |  | 180 mph to 189 | | |
|  | Truck |  | Truck |  | 190 mph to 199 | | |
|  | Truck |  | Truck |  | 200 mph to 209 | | |
|  | Truck |  | Truck |  | 210 mph to 219 | | |
|  | Truck |  | Truck |  | 220 mph to 229 | | |
|  | Truck |  | Truck |  | 230 mph to 239 | | |
|  | Truck |  | Truck |  | 240 mph to 249 | | |
|  | Truck |  | Truck |  | 250 mph to 259 | | |
|  | Truck |  | Truck |  | 260 mph to 269 | | |
|  | Truck |  | Truck |  | 270 mph to 279 | | |
|  | Truck |  | Truck |  | 280 mph to 289 | | |
|  | Truck |  | Truck |  | 290 mph to 299 | | |
|  | Truck |  | Truck |  | 300 mph to 309 | | |
|  | Truck |  | Truck |  | 310 mph to 319 | | |
|  | Truck |  | Truck |  | 320 mph to 329 | | |
|  | Truck |  | Truck |  | 330 mph to 339 | | |
|  | Truck |  | Truck |  | 340 mph to 349 | | |
|  | Truck |  | Truck |  | 350 mph to 359 | | |
|  | Truck |  | Truck |  | 360 mph to 369 | | |
|  | Truck |  | Truck |  | 370 mph to 379 | | |
|  | Truck |  | Truck |  | 380 mph to 389 | | |
|  | Truck |  | Truck |  | 390 mph to 399 | | |
|  | Truck |  | Truck |  | 400 mph to 409 | | |
|  | Truck |  | Truck |  | 410 mph to 419 | | |
|  | Truck |  | Truck |  | 420 mph to 429 | | |
|  | Truck |  | Truck |  | 430 mph to 439 | | |
|  | Truck |  | Truck |  | 440 mph to 449 | | |
|  | Truck |  | Truck |  | 450 mph to 459 | | |
|  | Truck |  | Truck |  | 460 mph to 469 | | |
|  | Truck |  | Truck |  | 470 mph to 479 | | |

NC 210
55 MPH

SIGNAL FACE I.D.
DEMOTES L.E.D.



SR 1330 (RALEIGH RD)
45 MPH

| | |
|--|--|
| TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT | |
| TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT | TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT |
| COLLISION DIAGRAM | |
| DIVISION: | AREA: |
| STUDY PERIOD: 3/1/2000 TO 7/31/2003 | |
| DISTANCE: T-MILE: 150 FT | |
| ANALYSIS PREPARED BY: S. Colwood | |
| DIAGRAM PREPARED BY: S. Colwood | |
| DIAGRAM REVIEWED BY: | |
| SAFETY EVALUATION | |
| AFTER FLASHER INSTALLATION | |
| SCALE: NOT TO SCALE | |
| DATE: 08/2/2003 | |
| LOG NUMBER: | |
| N.C. DEPARTMENT of TRANSPORTATION | |
| DIVISION of HIGHWAYS | |
| TRAFFIC ENGINEERING AND SAFETY | |
| SYSTEMS BRANCH | |